PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 36240PC01	FOR FURTHER ACTION	See Form PCT/IPEA/416
International application No. PCT/DK2005/000036	International filing date *(day/month/year)* 21.01.2005	Priority date *(day/month/year)* 22.01.2004
International Patent Classification (IPC) or national classification and IPC INV. B01F3/08		
Applicant SCF TECHNOLOGIES A/S		

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 16 sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:
   a. ☒ *sent to the applicant and to the International Bureau)* a total of 12 sheets, as follows:
      ☒ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
      ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
   b. ☐ *(sent to the International Bureau only)* a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in electronic form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:

☒	Box No. I	Basis of the report
☐	Box No. II	Priority
☒	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☒	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☒	Box No. VII	Certain defects in the international application
☒	Box No. VIII	Certain observations on the international application

Date of submission of the demand	Date of completion of this report
22.11.2005	26.04.2006
Name and mailing address of the international preliminary examining authority: European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016	Authorized officer Real Cabrera, R Telephone No. +31 70 340-4256

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/DK2005/000036

Box No. I Basis of the report

1. With regard to the **language**, this report is based on

   ☒ the international application in the language in which it was filed

   ☐ a translation of the international application into , which is the language of a translation furnished for the purposes of:
   - ☐ international search (under Rules 12.3(a) and 23.1(b))
   - ☐ publication of the international application (under Rule 12.4(a))
   - ☐ international preliminary examination (under Rules 55.2(a) and/or 55.3(a))

2. With regard to the **elements*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

Description, Pages	
1-35	as originally filed
Claims, Numbers	
108, 109	as originally filed
1-107	received on 22.11.2005 with letter of 22.11.2005
Drawings, Sheets	
1/8-8/8	as originally filed

   ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. ☐ The amendments have resulted in the cancellation of:
   - ☐ the description, pages
   - ☐ the claims, Nos.
   - ☐ the drawings, sheets/figs
   - ☐ the sequence listing *(specify)*:
   - ☐ any table(s) related to sequence listing *(specify)*:

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
   - ☐ the description, pages
   - ☐ the claims, Nos.
   - ☐ the drawings, sheets/figs
   - ☐ the sequence listing *(specify)*:
   - ☐ any table(s) related to sequence listing *(specify)*:

* *If item 4 applies, some or all of these sheets may be marked "superseded."*

Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

1. The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non-obvious), or to be industrially applicable have not been examined in respect of:

☐ the entire international application,

☒ claims Nos. 13-18, 21, 26-40, 42, 46-58, 63-77, 80-94, 96-105

because:

☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination *(specify)*:

☐ the description, claims or drawings *(indicate particular elements below)* or said claims Nos. are so unclear that no meaningful opinion could be formed *(specify)*:

☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed *(specify)*.

☒ no international search report has been established for the said claims Nos. 13-18, 21, 26-40, 42, 46-58, 63-77, 80-94, 96-105

☐ a meaningful opinion could not be formed without the sequence listing; the applicant did not, within the prescribed time limit:

☐ furnish a sequence listing on paper complying with the standard provided for in Annex C of the Administrative Instructions, and such listing was not available to the International Preliminary Examining Authority in a form and manner acceptable to it.

☐ furnish a sequence listing in electronic form complying with the standard provided for in Annex C of the Administrative Instructions, and such listing was not available to the International Preliminary Examining Authority in a form and manner acceptable to it.

☐ pay the required late furnishing fee for the furnishing of a sequence listing in response to an invitation under Rules 13*ter*.1(a) or (b) and 13*ter*.2.

☐ a meaningful opinion could not be formed without the tables related to the sequence listings; the applicant did not, within the prescribed time limit, furnish such tables in electronic form complying with the technical requirements provided for in Annex C-*bis* of the Administrative Instructions, and such tables were not available to the International Preliminary Examining Authority in a form and manner acceptable to it.

☐ the tables related to the nucleotide and/or amino acid sequence listing, if in electronic form only, do not comply with the technical requirements provided for in Annex C-*bis* of the Administrative Instructions.

☐ See separate sheet for further details

Box No. IV Lack of unity of invention

1. ☒ In response to the invitation to restrict or pay additional fees, the applicant has, within the applicable time limit:

   ☐ restricted the claims.

   ☐ paid additional fees.

   ☐ paid additional fees under protest and, where applicable, the protest fee.

   ☐ paid additional fees under protest but the applicable protest fee was not paid.

   ☒ neither restricted the claims nor paid additional fees.

2. ☐ This Authority found that the requirement of unity of invention is not complied with and chose, according to Rule 68.1, not to invite the applicant to restrict or pay additional fees.

3. This Authority considers that the requirement of unity of invention in accordance with Rules 13.1, 13.2 and 13.3 is:

   ☐ complied with.

   ☒ not complied with for the following reasons:

   see separate sheet

4. Consequently, this report has been established in respect of the following parts of the international application:

   ☐ all parts.

   ☒ the parts relating to claims Nos. 1-12,19,20,22-25,41,43-45,59-62,78,79,95,106,107 .

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	11,12
	No:	Claims	1-10,19,20,22-25,41,43-45,59-62,78,79,95,106,107
Inventive step (IS)	Yes:	Claims	-
	No:	Claims	1-12,19,20,22-25,41,43-45,59-62,78,79,95,106,107
Industrial applicability (IA)	Yes:	Claims	1-12,19,20,22-25,41,43-45,59-62,78,79,95,106,107
	No:	Claims	-

2. Citations and explanations (Rule 70.7):

   see separate sheet

Box No. VII Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see separate sheet

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

Re Item IV

Lack of unity of invention

1. The separate inventions/groups of inventions are:

- Group I (**claims 1-12,19,20,21-25,41, 43-45,59-62,78,79,95,106,107**): Use as one of the fluids CO2 containing a co-solvent.
- Group II (**claims 13-18**): Use as one of the fluids CO2 containing a surfactant.
- Group III (**claim 21**): Pressurized vessel operating at constant pressure.
- Group IV (**claim 26**): Continuous discharge.
- Group V (**claim 27**): Fluid withdrawn used to dissolve/extract substances.
- Group VI (**claims 28,29**): Water cores containing dissolved/disperse substance.
- Group VII (**claims 30-34, 38, 39**): Forming two separate emulsions.
- Group VIII (**claims 35-37, 40**): Microemulsion used as nanoreactor.
- Group IX (**claim 42**): Pressure control in recirculation loop.
- Group X (**claims 46-50, 55-58, 65**): Pressure container in recirculation loop.
- Group XI (**claims 51-54**): Ultrasonic generator in recirculation loop.
- Group XII (**claims 63, 64**): Atomizing nozzles in pressurised vessel.
- Group XIII (**claims 66, 67**): Surfactant added in pressurised container.
- Group XIV (**claims 68-77**): Use of hollow tubular membranes in pressure vessel.
- Group XV (**claims 80-945, 100, 101**): Use of microemulsion to be deposited on a substrate surface.
- Group XVI (**claim 96**): Use for microencapsulation of particles.
- Group XVII (**claims 97, 98**): Use for dispersing particles in solvent.
- Group XVIII (**claims 99, 105**): Particles formed comprising pharmaceutical/biological material.
- Group XIX (**claims 102-104**): Particles comprising an oxide.

2. They are not so linked as to form a single general inventive concept (Rule 13.1 PCT) for the following reasons:

2.1 The prior art EP-A-0 850 682 discloses a *method for producing micro emulsions dissolved or dispersed in a compressed fluid in a near critical or a supercritical state comprising:*

- *introducing a first fluid (30) into a pressurised vessel (6);*
- *introducing one or more surfactants (cf. column 8, lines 21-23) into said pressurised vessel;*
- *introducing a second fluid (8) into said pressurised vessel;*
- *promoting formation of micro emulsions of said second fluid within said first fluid present in said pressurised vessel.*

The subject-matter of **claim 1** therefore differs from this known method in that *one of the fluids is water or contains water, and said water or water mixture further contains one or more substances being dissolved therein.*

Said additional features are considered as obvious for the skilled person, the reasons being detailed in Item V (cf. §2).

The feature of dependent **claims 2-10, 19, 20, 22-25, 41, 43-45, 59-62, 78, 79, 95, 106 and 107** are also disclosed in the mentioned document.

2.2 Group I (**claims 1-12,19, 20, 22-25, 41, 43-45, 59-62, 78, 79, 95, 106 and 107**) is distinguished from the prior art by further revealing as special technical features the use as one of the fluids CO2 containing a co-solvent.

These special technical features make a contribution over the prior art by solving the problem of the use of a co-solvent together with the solvent CO2.

The special technical features of Group I, as defined in Rule 13(2) PCT therefore are:

- Use as one of the fluids CO2 containing a co-solvent.

2.3 Group II (**claims 13-18**) is distinguished from the prior art by further revealing as

special technical features the use as one of the fluids CO2 containing a surfactant.

These potential special technical features make a contribution over the prior art by solving the problem of using a surfactant together with the CO2.

The potential special technical features of Group II, as defined in Rule 13(2) PCT therefore are:

- Use as one of the fluids CO2 containing a surfactant.

2.4 Group III (**claims 21**) is distinguished from the prior art by further revealing as special technical features the use of a pressurized vessel operating at constant pressure.

These potential special technical features make a contribution over the prior art by solving the problem of using a pressurized vessel operating at constant pressure.

The potential special technical features of Group III, as defined in Rule 13(2) PCT therefore are:

- Pressurized vessel operating at constant pressure.

2.5 Group IV (**claim 26**) is distinguished from the prior art by further revealing as special technical features the continuous discharge of the micro emulsion formed.

These potential special technical features make a contribution over the prior art by solving the problem of continuously discharging the micro emulsion formed.

The potential special technical features of Group IV, as defined in Rule 13(2) PCT therefore are:

- Continuous discharge.

2.6 Group V (**claim 27**) is distinguished from the prior art by further revealing as special technical features the use of the fluid withdrawn to dissolve/extract substances.

These potential special technical features make a contribution over the prior art by solving the problem of using the fluid withdrawn to dissolve/extract substances.

The potential special technical features of Group V, as defined in Rule 13(2) PCT therefore are:

- Fluid withdrawn used to dissolve/extract substances.

2.7 Group VI (**claims 28, 29**) is distinguished from the prior art by further revealing as special technical features the water cores containing dissolved/disperse substance.

These potential special technical features make a contribution over the prior art by solving the problem of water cores containing dissolved/disperse substance.

The potential special technical features of Group VI, as defined in Rule 13(2) PCT therefore are:

- Water cores containing dissolved/disperse substance.

2.8 Group VII (**claims 30-34, 38, 39**) is distinguished from the prior art by further revealing as special technical features forming two separate emulsions.

These potential special technical features make a contribution over the prior art by solving the problem of forming two separate emulsions.

The potential special technical features of Group VII, as defined in Rule 13(2) PCT therefore are:

- Forming two separate emulsions.

2.9 Group VIII (**claims 35-37, 40**) is distinguished from the prior art by further revealing as special technical features the use of the microemulsion as nanoreactor.

These potential special technical features make a contribution over the prior art by solving the problem of using the microemulsion as nanoreactor.

The potential special technical features of Group VIII, as defined in Rule 13(2) PCT therefore are:

- Microemulsion used as nanoreactor.

2.10 Group IX (**claim 42**) is distinguished from the prior art by further revealing as special technical features the pressure control in recirculation loop.

These potential special technical features make a contribution over the prior art by solving the problem of controlling the pressure in the recirculation loop.

The potential special technical features of Group IX, as defined in Rule 13(2) PCT therefore are:

- Pressure control in recirculation loop.

2.11 Group X (**claims 46-50, 55-58, 65**) is distinguished from the prior art by further revealing as special technical features a pressure container in recirculation loop.

These potential special technical features make a contribution over the prior art by solving the problem of providing a pressure container in the recirculation loop.

The potential special technical features of Group X, as defined in Rule 13(2) PCT therefore are:

- Pressure container in recirculation loop.

2.12 Group XI (**claims 51-54**) is distinguished from the prior art by further revealing as special technical features the use of an ultrasonic generator in recirculation loop.

These potential special technical features make a contribution over the prior art by solving the problem of using an ultrasonic generator in recirculation loop.

The potential special technical features of Group XI, as defined in Rule 13(2) PCT therefore are:

- Ultrasonic generator in recirculation loop.

2.13 Group XII (**claims 63, 64**) is distinguished from the prior art by further revealing as special technical features the use of atomizing nozzles in pressurised vessel.

These potential special technical features make a contribution over the prior art by

solving the problem of using atomizing nozzles in pressurised vessel.

The potential special technical features of Group XII, as defined in Rule 13(2) PCT therefore are:

- Atomizing nozzles in pressurised vessel.

2.14 Group XIII (**claims 66, 67**) is distinguished from the prior art by further revealing as special technical features a surfactant added in pressurised container.

These potential special technical features make a contribution over the prior art by solving the problem of adding a surfactant in the pressurised container.

The potential special technical features of Group XIII, as defined in Rule 13(2) PCT therefore are:

- Surfactant added in pressurised container.

2.15 Group XIV (**claims 68-77**) is distinguished from the prior art by further revealing as special technical features the use of hollow tubular membranes in pressure vessel.

These potential special technical features make a contribution over the prior art by solving the problem of using hollow tubular membranes in pressure vessel.

The potential special technical features of Group XIV, as defined in Rule 13(2) PCT therefore are:

- Use of hollow tubular membranes in pressure vessel.

2.16 Group XV (**claims 80-94,100,101**) is distinguished from the prior art by further revealing as special technical features the use of microemulsion to be deposited on a substrate surface.

These potential special technical features make a contribution over the prior art by solving the problem of using the microemulsion to be deposited on a substrate surface.

The potential special technical features of Group XV, as defined in Rule 13(2) PCT therefore are:

- Use of microemulsion to be deposited on a substrate surface.

2.17 Group XVI (**claim 96**) is distinguished from the prior art by further revealing as special technical features the use for microencapsulation of particles.

These potential special technical features make a contribution over the prior art by solving the problem of the use for microencapsulation of particles.

The potential special technical features of Group XVI, as defined in Rule 13(2) PCT therefore are:

- Use for microencapsulation of particles.

2.18 Group XVII (**claims 97, 98**) is distinguished from the prior art by further revealing as special technical features the use for dispersing particles in solvent.

These potential special technical features make a contribution over the prior art by solving the problem of the use for dispersing particles in solvent.

The potential special technical features of Group XVII, as defined in Rule 13(2) PCT therefore are:

- Use for dispersing particles in solvent.

2.19 Group XVIII (**claims 99, 105**) is distinguished from the prior art by further revealing as special technical features particles formed comprising pharmaceutical/biological material.

These potential special technical features make a contribution over the prior art by solving the problem of forming particles comprising pharmaceutical/biological material.

The potential special technical features of Group XVIII, as defined in Rule 13(2) PCT therefore are:

- Particles formed comprising pharmaceutical/biological material.

2.20 Group XIX (**claims 99, 105**) is distinguished from the prior art by further revealing as special technical features particles comprising an oxide.

These potential special technical features make a contribution over the prior art by solving the problem of forming particles comprising an oxide.

The potential special technical features of Group XIX, as defined in Rule 13(2) PCT therefore are:

- Particles comprising an oxide.

The special technical features of Groups I-XIX are neither common nor the same or corresponding and solve different problems. Consequently the requirements of Unity of Invention (Rule 13(2) PCT) are not fulfilled.

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Reference is made to the following documents:
   D1: EP-A-0 850 682 (INOUE MFG., INC) 1 July 1998 (1998-07-01)
   D2: US-A-6 095 134 (SIEVERS ET AL) 1 August 2000 (2000-08-01)

2. Furthermore, the in Item VIII mentioned lack of clarity notwithstanding, the subject-matter of **claim 1** does not involve an inventive step in the sense of Article 33(3) PCT, and therefore the criteria of Article 33(1) PCT are not met.

   Document D1 discloses (cf. figure 6) a *method for producing micro emulsions dissolved or dispersed in a compressed fluid in a near critical or a supercritical state comprising:*
   - *introducing a first fluid (30) into a pressurised vessel (6);*
   - *introducing one or more surfactants (cf. column 8, lines 21-23) into said*

pressurised vessel;

- *introducing a second fluid (8) into said pressurised vessel;*
- *promoting formation of micro emulsions of said second fluid within said first fluid present in said pressurised vessel,*

from which the subject-matter of **claim 1** differs in that *one of the fluids is water or contains water, and said water or water mixture further contains one or more substances being dissolved therein.*

The problem to be solved by the present invention may therefore be regarded as improving the method in order to be able to perform a wider variety of reactions.

The solution proposed in **claim 1** of the present application cannot be considered as involving an inventive step (Article 33(3) PCT) for the following reasons:

a) It appears that providing a component dissolved instead of dispersed in one of the liquids (specifically in water) is an obvious possibility for the skilled person. Furthermore, said mere selection between obvious possibilities for the skilled person is recognised in the original **claim 7**, in which it says that *the water or water mixture contains one or more substances* ***preferably*** *being dissolved and/or dispersed therein.* No further hint can be found in the original disclosure indicating any unexpected effect when the substance is dissolved instead of being dispersed.

b) The use of fluids which carry additional substances **either dissolved or dispersed** for making emulsions with another fluid in a supercritical state is generally known in the art. Such a possibility is disclosed, for example, in document D2 (cf. column 4, lines 10-16; column 5, lines 13-21; or, column 6, lines 57-65). Therefore, the feature of the *one or more substances being dissolved* is merely one of several straightforward possibilities from which the skilled person would select, in accordance with circumstances, without the exercise of inventive skill, in order to solve the problem posed.

3. Dependent **claims 2-12, 19, 20, 22-25, 41, 43-45, 59-62, 78, 79, 95, 106 and 107**, do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of inventive step, the reasons being as follows:

3.1 The additional features of **claims 2-10,19, 20, 22-25, 41, 43-45, 59-62, 78, 79, 95, 106 and 107** are already disclosed in document D1, cf. figure 6.

3.2 The additional features of **claims 11 and 12** are already disclosed in document D2, cf. column 1, lines 40-45.

Re Item VII

Certain defects in the international application

1. Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the document D1 is not mentioned in the description, nor is this document identified therein.

2. The features of the claims are not provided with reference signs placed in parentheses (Rule 6.2(b) PCT).

Re Item VIII

Certain observations on the international application

1. The expression "*hereby included by reference...*" used in pages 5, 7, 16, 24 and 35 is not allowable. If it is considered essential that details of prior art documents be incorporated in the present application, this may only be done under the conditions described in the PCT Guidelines, Part-II, 4.05 and 4.26.

2. The relative term "*fine particles*" used in **claim 95** has no well-recognised meaning and leaves the reader in doubt as to the meaning of the technical features to which it refers, thereby rendering the definition of the subject-matter of said claim unclear, Article 6 PCT.

3. Regarding **claims 19, 20, 25, 43 and 61**, it must be considered that expressions as "preferably", "for example", "such as" or "advantageously" have no limiting effect on the scope of the claim. Thus, the features following such expression are to be

regarded as entirely optional (see PCT Guidelines, Part II, 5.40).

4. **Claim 25** does not meet the requirements of Article 6 PCT in that the matter for which protection is sought is not clearly defined. The claim attempts to define the subject-matter in terms of the result to be achieved, which merely amounts to a statement of the underlying problem, without providing the technical features necessary for achieving this result.

5. Apparatus **claim 106** is defined by referring to the method intended to be performed by it. Said definition of the apparatus claim is unclear (Article 6 PCT). The technical features needed to define the apparatus must be clearly disclosed in the claim.

6. The rights conferred by a method claim extend to the products directly obtainable by such a method. **Claim 107** is therefore unnecessary (cf. PCT Guidelines, Section II, 5.26 and Appendix, A5.26, A5.26[1] and A5.26[2]) and should be deleted.

CLAIMS

1. A method for producing micro emulsions dissolved or dispersed in a compressed fluid in a supercritical state comprising:

   - introducing a first fluid into a pressurised vessel;
   - introducing one or more surfactant/-s into said pressurised vessel;
   - introducing a second fluid into said pressurised vessel;
   - promoting formation of micro emulsions of said second fluid within said first fluid present in said pressurised vessel,

   wherein one of the fluids is water or contains water, and
   wherein said water or water mixture further contains one or more substances being dissolved therein.

2. A method according to claim 1 further comprising withdrawing in at least part time of said method a fluid stream comprising said micro emulsions suspended, dispersed or dissolved in said fluid being in a supercritical state.

3. A method according any of the claims 1-2, wherein said promotion of formation of micro emulsions is performed after introduction of said fluids and surfactant/-s into said pressurised vessel.

4. A method according to any of the claims 1-3, wherein one of the fluids is compressed CO_2.

5. A method according to claim 4, wherein said compressed CO_2 is a compressed liquid.

6. A method according to claim 5, wherein the compressed CO_2 is a supercritical fluid.

7. A method according to claim 7, wherein said water or water mixture further contains one or more substances preferably being dispersed therein.

8. A method according to any of the claims 7-8, wherein said one or more substances comprises polar molecules and/or polarizable molecules and/or non-

polar, non-volatile molecules.

9. A method according to claim 9, wherein said one or more substances is substantially insoluble in said compressed CO_2.

10. A method according to any of the preceding claims, wherein one of the fluids is an organic solvent, such as an oil.

11. A method according to claims 4-10, wherein said CO_2 containing fluid further comprises at least one co-solvent.

12. A method according to claim 12, wherein the co-solvent is selected from the group consisting of alcohol, water, ethane, ethylene, propane, butane, sulfurhexafluoride, nitrous oxide, chlorotrifluoromethane, monofluoromethane, methanol, ethanol, DMSO, isopropanol, acetone, THF, acetic acid, ethyleneglycol, polyethyleneglycol, N,N-dimethylaniline etc. and mixtures thereof.

13. A method according to any of the preceding claims, wherein said CO_2 containing fluid further comprises one or more surfactant/-s, comprising a CO_2-philic portion and a CO_2-phobic portion.

14. A method according to claim 14, wherein said surfactant/-s is/are chelate/-s and/or fluorinated surfactant/-s, and/or perfluoropolyether surfactant/-s, and/or fluroetherfluoracrylate surfactant/-s and/or siloxane surfactant/-s.

15. A method according to any of the claims 14-15, wherein said surfactant/-s is/are selected from the group consisting of hydrocarbons and fluorocarbons preferably having a hydrophilic/lipophilic balance value of less than 15, where the HLB value is determined according to the following formula: HLB = 7 + sum(hydrophilic group numbers)-sum(lipophilic group numbers).

16. A method according to any of the claims 14-16, wherein the amount of said surfactant/-s compared to the amount of water corresponds to a concentration in the range 0,01 to 10 weight %, such as a concentration in the range 0,05 to 5 weight %, preferably a concentration in the range 0,1 to 3 weight %, and advantageously a concentration in the range 0,5 to 2 weight %.

17. A method according to any of the claims 14-17, wherein the molar ratio of water

to said surfactant/-s is at least 5:1, such as a molar ratio of at least 10:1, preferably a molar ratio of at least 20:1, such as a molar ratio of at least 30:1, and advantageously a molar ratio of at least 50:1 such as at least 100:1.

18. A method according to any of the claims '14-18, wherein the molar ratio of compressed surfactant to the dissolved and/or dispersed molecules in said second fluid is at the most 100:1, such as at the most 50:1, and preferably at the most 30:1 such as at the most 10:1.

19. A method according to any of the preceding claims, wherein the pressure of at least one of said fluids is in the range 50-500 bars, preferably in the range 85-500 bars, such as in the range 100-300 bars.

20. A method according to any of the preceding claims, wherein the temperature in said pressurised vessel is maintained in the range 20-500 °C, such as 30-450 °C, and preferable in the range 35-200 °C, and more preferable in the range 40-150 °C.

21. A method according to any of the preceding claims, wherein said pressurised vessel is operating at a substantially constant pressure.

22. A method according to any of the preceding claims, wherein said emulsion formed is a micro- or nano emulsion.

23. A method according to claim 23, wherein the diameter of the core/-s of said micro- or nano emulsion/-s is/are at least partly controlled by controlling the density of said fluid/-s present within said pressurised vessel.

24. A method according to any of the claims 23-24, wherein said micro emulsion/-s formed comprises a water core/-s.

25. A method according to claim 25, wherein the diameter of said water core/-s is/are at the most 5 micron, such as a diameter of at the most 1 micron, preferably a diameter of at the most 500 nm such as a diameter of at the most 250 nm, and more preferably a diameter of said water core/-s of at the most 100 nm such as a diameter of at the most 50 nm, and advantageously the diameter of said water core/-s is below 30 nm.

26. A method according to any of the claims 23-26, wherein said micro emulsion/-s formed is continuously withdrawn from said pressurised vessel.

27. A method according to any of the claims 25-27, wherein said micro emulsion/-s containing fluid being withdrawn from said pressurised vessel is used to dissolve and/or extract substances from a material in a device outside such as downstream of said pressurised vessel.

28. A method according to any of the claims 25-27, wherein said water core comprises dissolved and/or dispersed substances.

29. A method according to claim 29, wherein said fluid/-s containing said micro emulsion/-s is/are used as carrier/-s for transporting dissolved and/or dispersed species to an external device.

30. A method according to any of the preceding claims, wherein two or more micro emulsions of different compositions is produced in separate pressurised vessels and the fluids containing said micro emulsions are combined in an external device.

31. A method according to claim 31, wherein said two emulsions of different composition are formed using at least two different surfactants.

32. A method according to claim 32, wherein said surfactants are designed with electrostatic forces so as to facilitate contact of micelles of different type and to reduce merging of micelles of same type.

33. A method according to claim 33, wherein said electrostatic forces are introduced by including a molecular charge displacement in the lipophilic part of the surfactant.

34. A method according to claim 34, wherein said molecular charge displacement are obtained by introducing polarity from organic molecular groups selected from halogenated alkyls and/or halogenated aryls and/or aldehydes, and/or ketones and/or ethers and/or hetero-cyclic structures containing oxygen, nitrogen and/or sulphur and/or amides and/or mercaptanes.

35. A method according to any of the preceding claims, wherein said micro emul-

sion/-s is/are used as nanoreactors for synthesis of a nanoparticle materials.

36. A method according to claim 36, wherein at least one chemical reaction is occurring in said micro emulsions.

37. A method according to any of the claims 36-37, wherein said micro emulsion/-s is/are used as template/-s for controlling said particulate material into a specific shape, size and/or structure.

38. A method according to any of the claims 31-38, wherein the average size of said nanoparticle material formed is maximum 5000 nm, such as an average size of maximum 500 nm, preferably the average size is maximum 100 nm, and most preferably the average size is maximum 30 nm, such as maximum 15 nm.

39. A method according to any of the claims 31-38, wherein the average size of said nano particle material formed is in the range 0,1-30 nm, such as in the range 1-10 nm.

40. A method according to any of the claims 36-40, wherein said synthesis of said nanomaterials is at least partly controlled by controlling the temperature and/or the pressure of the fluid/-s during said synthesis.

41. A method according to any of the preceding claims, comprising re-circulating in at least part time of the method at least part of a fluid or fluid mixture present in said pressurised vessel, the re-circulating comprising withdrawing from the vessel at least part of a fluid contained in said vessel and feeding it to a re-circulation loop and subsequently feeding it back to said pressurised vessel.

42. A method according to claim 42, further comprising the step of controlling the temperature of the fluid in the re-circulation loop.

43. A method according to any of the claims 42-43, wherein the fluid volume being withdrawn from said vessel to said re-circulation loop corresponds to exchange of at least 0,1 vessel volume per minute such as at least 0,25 vessel volumes per minute, preferably the fluid volume corresponds to exchange of least 0,5 vessel volumes per minute, and even more preferably exchange of at least 1 vessel volume per minute and advantageously the fluid volume being withdrawn corresponds to exchange of at least 2 vessel volumes per minute such as ex-

change of at least 5 vessel volumes per minute.

44. A method according to any of the claims 42-44, wherein said re-circulation loop comprises at least one mixing zone for promoting formation of micro emulsion/-s.

45. A method according to any of the claims 42-45, wherein said mixing zone/-s in said re-circulation loop comprises a static mixer.

46. A method according to any of the claims 42-46, wherein said mixing zone/-s in said re-circulation loop comprises a pressurised container with a high shear rate mixer.

47. A method according to claim 47, wherein said high shear rate mixer comprises a motor driven mixer such as an impeller such as a propeller or turbine rotor.

48. A method according to claim 48, wherein impeller comprises a stator and a rotor.

49. A method according to claims 49, wherein said high shear rate mixing is obtained by maintaining the distance from the surface of rotor to the surface of the stator is below 5 mm such a distance of below 2,5 mm, and preferably below 1 mm such as below 0,5 mm, and advantageously below 0,2 mm.

50. A method according to claim 47-50, wherein said high shear rate mixer in said pressurised container in said re-circulation loop comprises a rotor rotating with a speed of at least 5000 rpm such as a speed of at least 10000 rpm, and preferably at a speed of at least 15000 rpm such as a speed of at least 20.000 rpm, and advantageously the rotor is rotating at a speed of 24000 rpm or more.

51. A method according to any of the claims 42-51, wherein said re-circulation loop comprises ultrasonic generating means for generating ultrasonic waves or vibration waves in/of said fluid being withdrawn to said recirculation loop.

52. A method according to claim 52, wherein the frequency of said ultrasonic generating means are in the range 20 kHz to 10 MHz such as in the range 20 kHZ to 2 MHz and preferably in the range 20 kHz to 50 kHz such as in the range 40-50 kHz.

53. A method according to any of the claims 52-53, wherein said ultrasonic generating means comprises a piezoelectric or magneto-restrictive structure.

54. A method according to any of the claims 52-54, wherein said ultrasonic generating means are placed within said pressurised container within said re-circulation loop.

55. A method according to any of the claims 42-55, wherein said mixing in said one or more mixing zone/-s for promoting formation of said micro emulsions, is at least partly provided by atomizing said fluid being withdrawn to said re-circulation loop by spraying said fluid into said pressurised container in said re-circulation loop through one or more nozzles.

56. A method according to claim 56, wherein said one or more nozzles is/are ultrasonic nozzles.

57. A method according to claim 56, wherein said one or more nozzles comprise/-s one or more membranes situated within said pressurised container within in said re-circulation loop.

58. A method according to claim 58, wherein said one or more membranes comprises the inner wall of said pressurised container within said re-circulation loop.

59. A method according to any of the preceding claims, wherein said pressurised vessel is an agitated vessel.

60. A method according to claim 60, wherein said agitation is provided by a motor driven mixer such as an impeller.

61. A method according to claim 61, wherein said impeller is rotating with a speed in the range 100-5000 rpm, such as an impeller with a rotating speed in the range 250-3000 rpm, and preferably in the range 500-2000 rpm.

62. A method according to any of the preceding claims, wherein said pressurised vessel comprises ultrasonic generating means.

63. A method according to any of the claims 60-63, wherein said pressurised vessel

further comprises one or more atomising nozzles.

64. A method according to claim 64, wherein said atomising nozzles comprise at least one ultrasonic nozzle.

65. A method according to any of the claims 42-65 comprising withdrawing from an agitated pressurised vessel at least part of a fluid or a fluid mixture contained in said agitated pressurised vessel and feeding it to a re-circulation loop, said re-circulation loop comprising a pressurised container comprising a high shear rate mixer for promoting formation of micro emulsions, and subsequently feeding said fluid or fluid mixture back to said pressurised vessel.

66. A method according to claim 66, wherein said second fluid and/or said surfactant/-s are introduced into said pressurised container in said re-circulation loop.

67. A method according to claim 67, wherein said second fluid and/or said surfactant/-s are premixed prior to introduction into said pressurised container.

68. A method according to any of the preceding claims, wherein said pressurised vessel comprises a plurality of hollow tubular members, at least part of the walls of said hollow tubular members comprising membranes, the plurality of hollow tubular members defining interstices therebetween allowing for flow and

- Contacting the outer surface of a plurality of said hollow tubular members with a first fluid, and

- Contacting a second fluid with the inner surface of said hollow tubular members, at least part of said second fluid is permeating said membrane walls forming a plurality of emulsions of said second fluid dispersed in said first fluid.

69. A method according to claim 69, wherein the membrane part of said hollow tubular members comprises porous membranes.

70. A method according to claim 70, wherein the pore size of said porous membranes is in the range 0,001-100 microns, such a pore size in the range 0,01-10 micron, and preferably having pores in the range 0,01-0,2 micron.

71. A method according to any of the claims 69-71, wherein the diameter of said water core in the emulsions formed is in the range 0.001-30 times the diameter of the pores of the membrane part of said hollow tubular members, such as in the range 0.01-15 times the diameter of the pores of the membrane part of said hollow tubular members, and preferably in the range 0.1-10 times the diameter of the pores of said hollow tubular members.

72. A method according to any of the claims 69-72, wherein the pressure of the fluid/-s contacting the inner surface of said hollow tubular members is higher than the pressure of the first fluid.

73. A method according to claim 73, wherein the pressure differences between the fluid/-s contacting the inner surface of said hollow tubular members and the first fluid is in the range 0,01-100 bars, such as in the range 0,1-50 bars, and preferably in the range 0,1-20 bars such as in the range 0,1-10 bars.

74. A method according to any of the claims 69-74, wherein said hollow tubular members comprise hollow fibres.

75. A method according to any of the claims 69-75, wherein said membrane is a ceramic or polymeric membrane.

76. A method according to any of the claims 69-76, wherein the temperature profile within said pressurized vessel is controlled by controlling the temperature and flow rate of at least one fluid contacting the inner surface of said hollow tubular members.

77. A method according to any of the claims 69-77, wherein said tubular members comprise two separate set of hollow tubular members, both sets of said hollow tubular members comprising an inlet and an outlet plenum communicating with the outside of said pressurized vessel, and wherein two separate fluids may be contacted with the inner surface of said hollow tubular members, and wherein two different emulsions of said fluids in said first fluid contacting the outer surface of said hollow tubular members are formed.

78. A method according to any of the preceding claims, wherein the first fluid containing said micro emulsion/-s is/are expanded in a device external to the pressurised vessel.

79. A method according to claim 79, wherein the first fluid is rapidly expanded through one or more nozzles using a RESS or a RESOLV technique.

80. A method according to any of the claims 79-80, wherein the content of said micro emulsions formed is/are deposited on the surface of a substrate such as on the surface of solid material.

81. A method according to claim 81, wherein said material being deposited comprises an inorganic substance.

82. A method according to claim 81, wherein said material being deposited comprises a pharmaceutical substance such as a medical agent, a biologically active material, an antigen, an enzyme, a therapeutic protein or a therapeutic peptide.

83. A method according to any of the claims 81-82, wherein said material being deposited comprises one or more metal/-s and/or one or more semi-metal/-s, or one or more metal oxide/-s and/or one or more semi-metal oxide/-s.

84. A method according to claim 81, wherein said material being deposited comprises an electroceramic material.

85. A method according to claim 81, wherein said material being deposited material comprises a semi-conducting material.

86. A method according to any of the claims 81, wherein said material being deposited comprises a magnetic, ferromagnetic, paramagnetic, or supermagnetic material.

87. A method according to any of the claims 81-87, wherein the deposited material constitutes a layer of primary particles having an average diameter of the most 30 nm such as at the most 20 nm, such as at the most 10 nm.

88. A method according to claim 88, wherein the thickness of said layer is at the most 500 nm, such as at the most 100 nm, and preferably at the most 50 nm such as at the most 25 nm.

89. A method according to any of the claims 81-89, wherein said solid material be-

ing treated comprises a tape cast for tape casting.

90. A method according to any of the claims 81-89, wherein said treated solid material comprises a catalyst material.

91. A method according to any of the claims 81-89, wherein said treated solid material comprises a ceramic membrane.

92. A method according to any of the claims 81-89, wherein said treated solid material comprises a fuel cell material.

93. A method according to any of the claim 81-89, wherein said treated solid material comprises a photolithographic lens or mask.

94. A method according to claim 81, wherein said treated solid material comprises a medical and/or a pharmaceutical article.

95. A method according to any of the preceding claims, wherein said external device is an apparatus for producing fine particles.

96. A method according to claim 96, wherein one or more additional fluids containing micro emulsions with substances dissolved and/or dispersed therein, is introduced into said external device, so as to perform a micro encapsulation of said fine particles formed.

97. A method according to claim 96, wherein said external device contains a solvent and said fine particles are collected as a dispersion of said fine particles within said solvent.

98. A method according to claim 96, wherein said solvent further comprises a reactant for said particle formation process.

99. A method according to any of the preceding claims, wherein said primary particles formed comprise one or more pharmaceutical and/or biological material/-s.

100. A method according to any of the preceding claims, wherein said material being deposited and/or collected comprise one or more metal/-s and/or one or more semi-metal/-s or a combination thereof.

101. A method according to claim 101, wherein the electrolyte dissolved and/or dispersed within said micro emulsions is/are a reactant/-s in a supercritical sol-gel reaction.

102. A method according to any of the preceding claims, wherein said fine particles formed comprises oxide/-s such as metal oxide/-s or semi-metal oxide/-s.

103. A method according to claim 103, wherein said oxides is/are a thermoelectric material or a precursor for production of a thermoelectric material.

104. A method according to any of the claims 101-103, wherein said oxide/-s are an oxygen ion conducting oxide/-s such as $Ce_{1-x}Gd_xO_{2-x/2}$, $LaGaO_3$, or doped ZrO_2

105. A method according to any of the claims 101-58 , wherein said primary particles formed are carbide/-s and/or nitride/-s and/or sulphides and/or borides and/or hydrides and/or halogenides.

106. An apparatus comprising means according to any preceding claims thereby being adapted to carry out the method according to any of the preceding claims.

107. A product produced from a method according to any of the preceding claims.